Iconic reporting: a new way of communicating radiological findings

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Orthopaedic surgeons frequently refer patients to imaging centers for MR and CT studies in order to make a final decision about surgery or treatment. Typically, the radiologist studies the images of each case and dictates a full text report describing the findings. The text report is then transcribed, printed and returned to the radiologist for a final review and signature. At the Laurie Imaging Center in New Brunswick, New Jersey, the full text report contains three parts: a description of the MRI study, a narrative description of the findings and an impression. The latter contains the essence of the interpretation, and constitutes the most relevant part of the report that affects the decision to be made by the surgeon. There are several drawbacks to conventional text reports: writing them is cumbersome, they contain ambiguities due to their textual nature, and they do not facilitate the development of well-defined outcome and retrospective studies. These lead to inefficiencies in communicating the radiological findings.

We have developed an iconic report format for expressing the essential information as a new approach to communicate the radiologists' observations. The basic elements in an iconic report are: a *visual template* which is a 2D abstraction of the anatomical structure contained in the images, and a small set of *icons* providing the classes to be associated with specific parts of the image. An *iconic report* associates a particular set of icon instances with specific *locations* within the visual template.

We have designed a computer-based environment for the knee joint ([1]). The visual template of the knee joint consists of three views of an idealized knee, depicting only the main anatomical structures. Icons were designed to represent typical knee finding categories, such as: tear, degeneration, cyst, effusion, etc. A retrospective analysis of 100 MRI knee examinations was performed. In the study, one radiologist filled the iconic reports and two orthopaedic surgeons reviewed them, in blinded fashion, as well as conventional text-based reports, and dictated a course of action based on each. The results of this validation were that the iconic reports provide an intuitive yet powerful innovative visual language for the radiologist to clearly and precisely identify and localize lesions, leading to concise and efficient illustrations of findings. No essential information was lost and outcomes from the two reports did not differ significantly.

To formalize and generalize the results obtained in this empirical validation, a computer-based representation of anatomic knowledge is being developed. The goal of this representation is to determine the conditions necessary for ensuring semantic consistency of corresponding iconic and text reports. A semantic representation ([2] and [3]) for the iconic reports was designed and used to compare the two types of reports. The comparison is performed by translating each pair of reports into the semantic representation. The text reports contain ambiguities, so their translation need not be unique. In this case *all possible* interpretations of a given text report are found. The comparison for semantic consistency is established between the semantic representation of the iconic report and all the possible interpretations of the text report. This might be an infeasible task in general natural language, but for any restricted anatomical structure template as the knee it is a reasonable goal. Since the iconic reports use an idealized visual template of the anatomic structure the location of some icons can be ambiguous. This ambiguity however can be constrained by using the text report, which usually specifies the location explicitly.

The iconic reports provide an efficient, economical means of reporting radiologic findings and offer a new mechanism to control ambiguity and communicate essential detail.

References

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